

REMARKS

Claims 1, 9, 15 and 17-23 are in this application and are presented for consideration. By this amendment, Applicant has amended claims 1, 9 and 15. New dependent claim 23 has been added.

Claims 1, 9, 15 and 17-22 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Choo et al. (U.S. 6,407,360) in view of Okamoto (U.S. 5,502,001) and Xuan (U.S. 6,303,898).

Claims 1, 9 and 15 have been amended to highlight that the determination unit includes a window comparator that determines whether a level of light received after reflecting the light on a blind crack is between predetermined thresholds V_{ref1} and V_{ref2} . The determination with the window comparator determines that the blind crack is defective when the level of light is greater than threshold V_{ref1} or less than threshold V_{ref2} . The determination with the window comparator determines that the blind crack is normal when the level of light is between the thresholds V_{ref1} and V_{ref2} . This advantageously allows the determination unit to determine the state of the blind crack and to differentiate between a normal blind crack and a defective blind crack when a blind crack has been formed or whether a blind crack has formed at all. This advantageously increases manufacturing and product efficiency of flat panel displays since the brittle substrate materials are broken properly as a result of checking whether the blind crack has been properly formed. The prior art as a whole fails to disclose such features or blind crack shape state determining advantages.

Choo et al. fails to teach and fails to suggest the combination of a determination unit

including a window comparator that determines whether an amount of light received from a blind crack is within predetermined thresholds V_{ref1} and V_{ref2} . Compared with the present invention, Choo et al. only discloses a microprocessor 400 that detects whether a propagation path 120' is on a predetermined scribe line 120. However, the microprocessor 400 of Choo et al. does not compare a detected level of light from a blind crack with predetermined thresholds to determine whether the shape state of the blind crack is defective or normal as featured in the present invention. In contrast with Choo et al., the determination unit of the present invention includes a window comparator that extracts the state of the light receiving signal from a light reception element and compares it to predetermined thresholds V_{ref1} and V_{ref2} to determine whether a blind crack is normal or defective or whether a blind crack has been formed at all. This advantageously allows for a simple and quick determination of whether the substrate can be properly broken. Choo et al. fails to be concerned with detecting the shape state of a blind crack to determine whether a substrate can be properly cracked. Instead, Choo et al. addresses the problem of making sure that a propagation path 120' of a generated crack follows a predetermined marked scribe line 120. The microprocessor 400 of Choo et al. merely determines whether the propagation path 120' follows the predetermined scribe line 120, but Choo et al. fails to direct the person of ordinary skill in the art toward a determination unit that determines a shape state of a blind crack based on whether light reflected from the blind crack is within acceptable limits. As such, the prior art as a whole takes a different approach and fails to direct the person of ordinary skill in the toward a determination unit including a comparator as claimed.

Okamoto fails to teach or suggest the combination of a determination unit including a comparator that determines the condition of the shape state of a blind crack. At most, Okamoto discloses a light beam-forming apparatus 10 having a beam expander 11, mirrors 12, 13, 14, half-mirrors 15, 16, lenses 17, 18 and an objective lens 5 that are arranged on an optical path that links a source 1 of light of the optical system to a sample 2. However, Okamoto provides absolutely no suggestion or teaching for a determination unit including a comparator that compares a light receiving signal from a light reception element with predetermined thresholds to determine the shape state of a blind crack. Compared to Okamoto, the determination unit of the present invention determines whether a blind crack has been formed and if the blind crack is normal or defective based on whether the light received is within acceptable thresholds. This advantageously increases manufacturing and product efficiency of flat panel displays since the brittle substrate materials are broken properly as a result of checking whether the blind crack has been properly formed. Okamoto fails to disclose such efficiency advantages since Okamoto only directs the person of ordinary skill in the art toward a light beam-forming apparatus, but does not disclose a determination unit including a comparator that compares reflected light from a blind crack to predetermined thresholds V_{ref1} and V_{ref2} as featured in the present invention. As such, the prior art as a whole takes a different approach and fails to direct the person of ordinary skill in the art toward each feature of the claimed combination.

Xuan also fails to teach and fails to suggest the combination of a determination unit including a comparator that determines a shape state of a blind crack based on whether light

reflected from a blind crack is within acceptable predetermined limits. At most, Xuan discloses sub-laser light beams 301 that form a pattern on surfaces 211 and 212. However, Xuan does not teach or suggest a determination unit with a comparator that compares light received from a blind crack to predetermined thresholds to determine whether the blind crack is defective or normal as featured in the present invention. Xuan merely is concerned with laser texturing a magnetic recording medium, but fails to direct the person of ordinary skill toward addressing the problem of determining the condition of a blind crack by determining whether the light reflected from a blind crack is within predetermined thresholds. As such, the prior art as a whole takes a different approach and fails to direct the person of ordinary skill in the art toward the claimed combination. Accordingly, Applicant respectfully requests that the Examiner favorably consider claims 1, 9 and 15 and all claims that respectively depend thereon.

Applicant has added new dependent claim 23 to further clarify the features of the invention. New dependent claim 23 provides that the determination unit determines whether the light reflected from the blind crack is within predetermined limits when the light is reflected on a surface of the substrate and not when the light is projected at both ends of the substrate. Applicant respectfully requests that the Examiner favorably consider new dependent claim 23 as presented.

Favorable consideration on the merits is requested.

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